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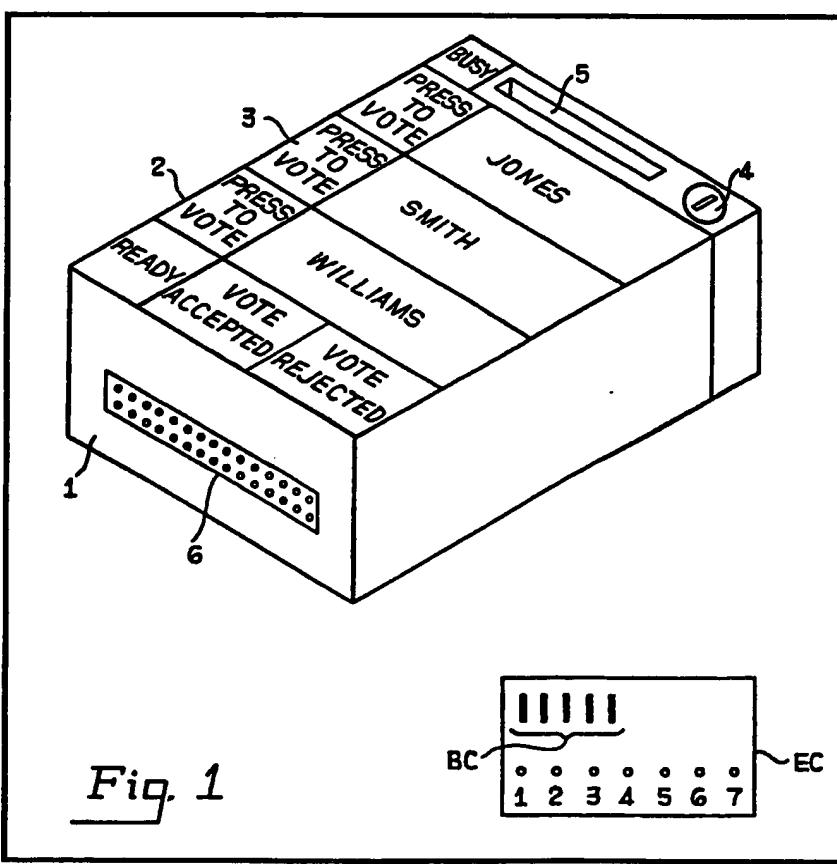
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(54) Electronic voting machine

(57) A portable voting machine 1 suitable for use in current polling booths having a vote selection display area 2 layed out in a manner similar to an existing voting slip and including a voting pad 3 for each vote selection. The machine including electronic counters arranged to register the manual activation of a voting pad 3 and being unlocked for use only upon reception of a suitably encoded card EC upon which is also recorded the vote selection. The encoded card EC being retained within the voting machine after a vote registration operation is complete.



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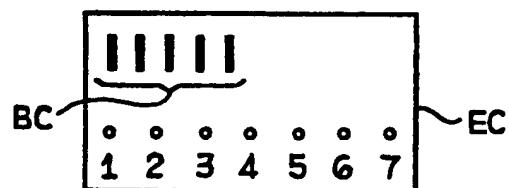
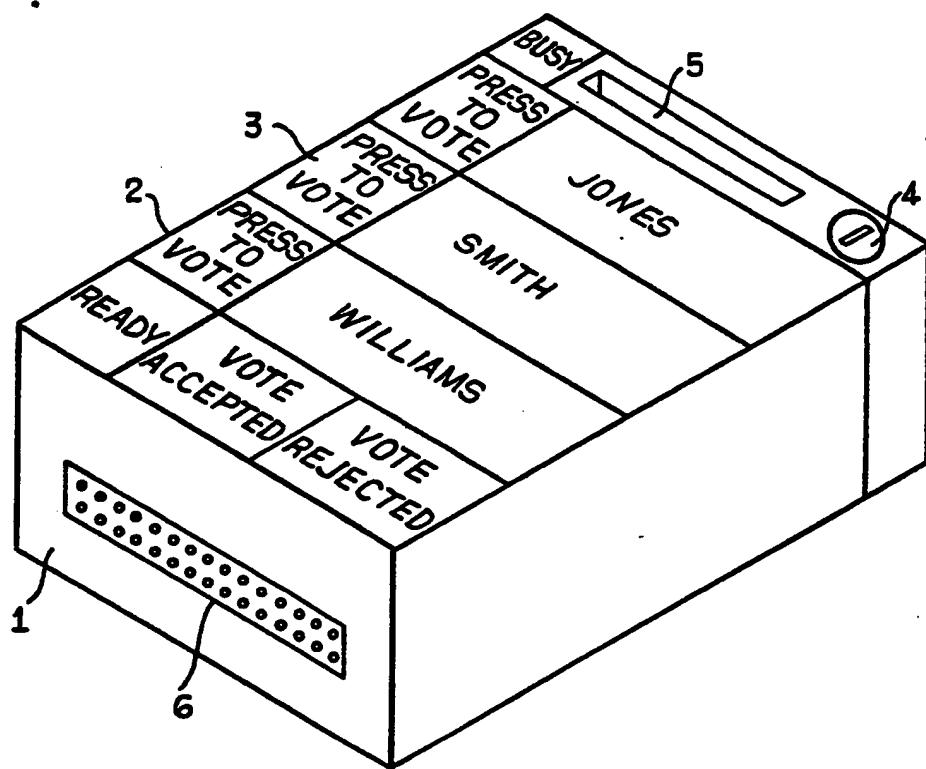


Fig. 1

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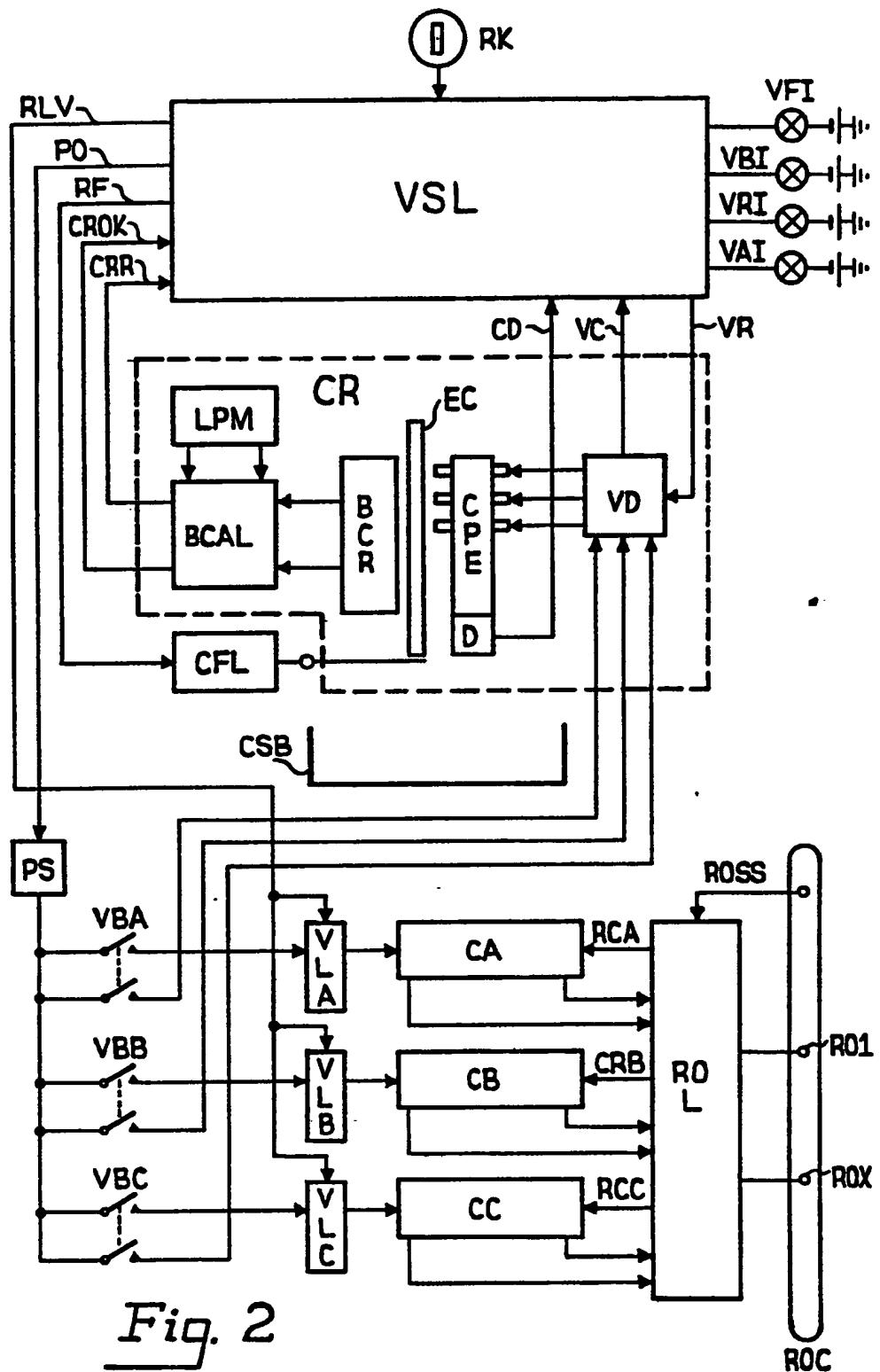


Fig. 2

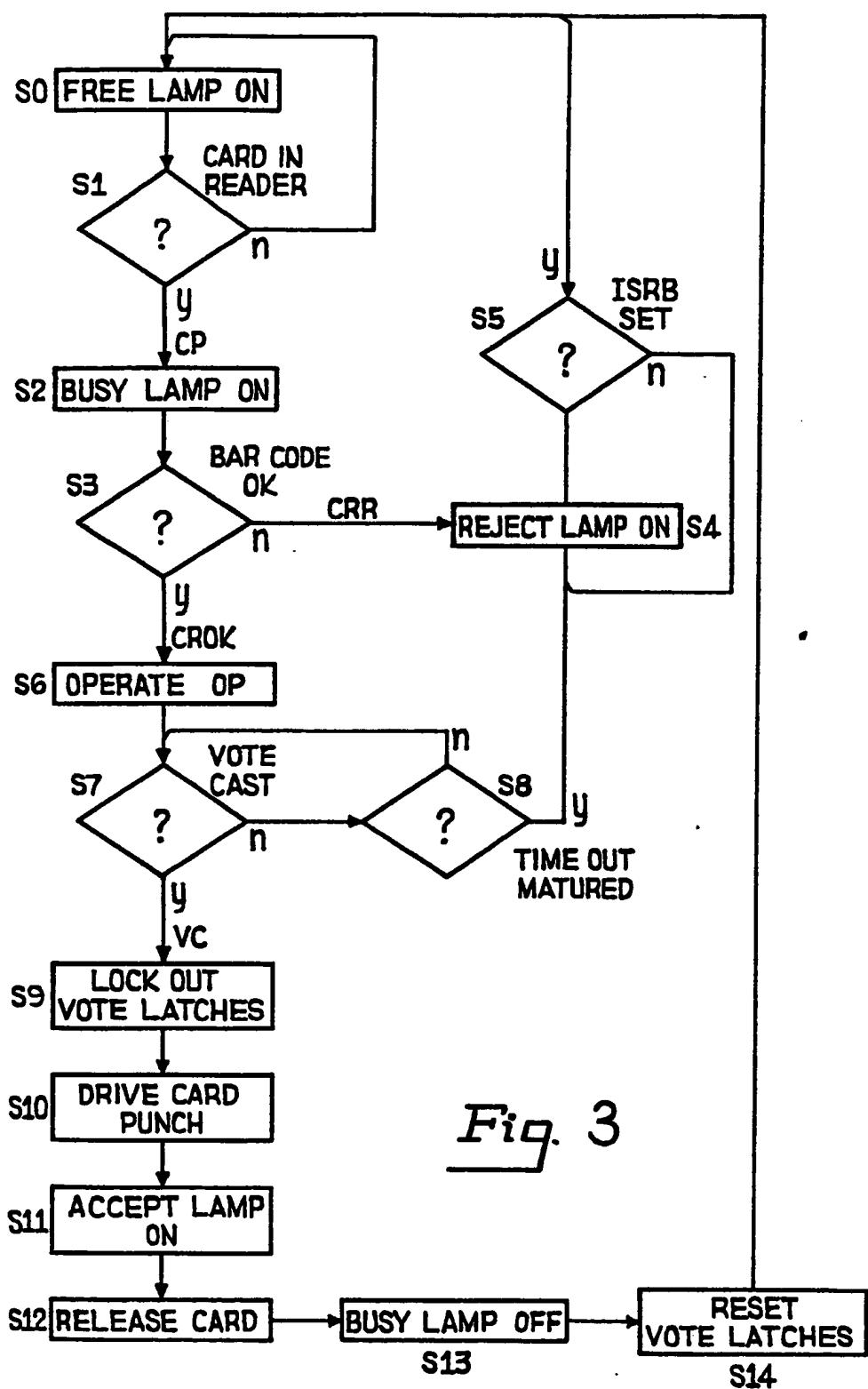


Fig. 3

SPECIFICATION

Electronic voting machine

5 *Field of the invention*

The present invention relates to electronic voting machines and is more particularly concerned with the provision of a portable electronic voting machine which may be used to 10 replace the voting slip system without substantially altering the current electoral procedures.

Prior art

- 15 In the current British electoral system, for example, a voter is given a validated voting slip carrying the voting selection after identifying himself to the polling station staff using the electoral roll. The voter then takes 20 the voting slip to a voting booth and marks the required vote selection with a pencil cross. After casting the vote the marked voting slip is placed in a voting box which ultimately, together with many other voting boxes, will 25 be taken to some central place for the vote counting process. The handling of the voting boxes and the voting slips is a very labour intensive and consequently time consuming and costly operation.
- 30 It is an aim of the present invention to provide an electronic voting machine which reduces the labour involved in the handling of votes without substantially changing the system as far as the voter is concerned.

35 *The invention*

According to the invention there is provided a voting machine having (i) a selection presentation area including a plurality of manually operable electrical switching devices, one for each vote selection, (ii) a plurality of electronic counters, at least one for each vote selection and adapted to register the operation of the corresponding electrical switching device and 40 (iii) a vote selection mechanism locking arrangement adapted to be unlocked by a suitably coded card, the machine being arranged such that the reception of the suitably coded card frees the vote selection mechanism to allow a vote selection to be recorded in the appropriate electronic counter and the coded card is retained in the voting machine.

By such an arrangement each vote may be recorded twice – once electronically and also 55 physically on the coded card. In the event of failure of the electronics the accumulated coded cards can be used to recover the vote result for the particular machine.

Typically the machine is "unlocked" by the 60 presentation of a bar coded (electoral roll) card which may be given to the voter by the polling staff or alternatively sent to his home address. Also the coded card once identified may be subjected to a hole punch operation 65 to record the vote actually cast.

The electronic voting machine is made in portable form so that it can be removed from a polling booth and transported to the central vote counting station for read-out under the

- 70 control of the electoral Returning Officer. At the central station the contents of the counters are read-out electronically and may then be totalised using computer-like equipment. Such an arrangement substantially reduces 75 the human effort required to record the votes cast and has the very significant advantage that in the event of a electronic counting failure the votes can still be recovered by "reading" the punched coded cards in a 80 manner similar to that used to count voting slips. Obviously the electronic read-out method is substantially quicker than counting votes by hand and each polling booth effectively is provided with its own polling box 85 which again assists in reducing the labour required to conduct a ballot.

Description of one embodiment of the invention

- 90 The invention will be more readily understood from the following description of one embodiment which should be read in conjunction with the accompanying drawings. Of the drawings
- 95 *Figure 1* shows a schematic diagram of the voting machine and a coded card
- Figure 2* shows a block diagram of the electronic equipment used in the machine, while
- 100 *Figure 3* shows a flow diagram of the sequence of operations of the machine in use. Considering firstly Fig. 1 it will be seen that the machine consists of a box 1 having a top surface 2 which is used as the vote selection presentation area, displaying, for example, the names of the candidates (i.e. JONES, SMITH and WILLIAMS). Typically this area is layed out in the same manner as existing voting slips with the addition of indicators (such as 105 lamps) to indicate that the machine is ready for use (READY), the machine is in use (BUSY), a vote has been accepted (VOTE ACCEPTED) and a vote has been rejected (VOTE REJECTED). By the side of each selection display area is a voting pad such as 3 (sign written with PRESS TO VOTE) which is pressed to register a vote. Typically the machine is arranged to respond by illuminating the VOTE RECORDED indicator. The vote selection presentation area is arranged to be adjustable so that say name carrying slides can be fitted into it to adjust the selections from one election to another.
- 115 The machine also includes an electoral officer reset button 4 which may be a key operated electrical switch arranged to restore the machine after a "VOTE REJECTED" sequence has occurred. Such a sequence could occur if an incorrectly coded card is inserted 120 into the coded card slot 5. The way in which

the coded card EC is used to free the voting machine will be seen later in this description.

Finally the machine includes a read-out connector, shown as 6 in Fig. 1, and this would normally not be seen when the machine is mounted in the desk portion of the polling booth. The read-out connector 6 is used to connect the voting machine into an electronic vote registration and totalisation arrangement

10 in the central recording station.

The box is arranged to be of larger size than is required to simply accommodate the electronics as it is also used to accommodate the coded cards. Typically the machine is of the order of 75 cms by 45 cms with a depth of say 45 cms. The coded cards can be quite small in size, of the order 5 cms by 2.5 cms and they are substantially smaller than conventional voting slips.

20 In operation a voter places his coded card EC into the slot 5. The machine validates the card (i.e. reads the bar code defined as BC and compares it with an internally programmed code) and illuminates the BUSY indicator. The voter then presses the required "PRESS TO VOTE" pad and if accepted the "VOTE ACCEPTED" indicator is illuminated. Alternatively the "VOTE REJECTED" indicator may be illuminated and the electoral staff 30 would then be summoned to clear up the difficulty. In this case the reset button 4 is used by the electoral officer to reset the machine. Each vote is accumulated in a selection counter and also recorded on the coded 35 card using, for example, a hole punch machine to punch a hole at the required position of positions 1 to 7 on the card in accordance with the selection made.

40 Referring now to Fig. 2 consideration will be given to the electronic and electrical equipment required for the portable voting machine. Typically the machine will be battery operated with the batteries recharged when the machine is not in use. The machine includes (i) a coded card reader CR, (ii) a flapped card stack bin CSB (iii) a number of vote or selection counters CA, CB, CC, (one for each vote selection) (iv) a number of vote pad activated switchings devices VBA, VBB, 45 VBC (one device for each vote selection), (v) a read-out logic arrangement R-OL and (vi) a machine sequence controller VSL. In addition four indicators VFI (READY), VBI (BUSY), VAI (ACCEPTED) and VRI (REJECTED) are provided together with some items of electronic equipment which will be described later when considering the operation of the machine.

45 The coded card reader CR consists of a card-present detector D, a bar code reader BCR, a bar code acceptor logic BCAL, a local programmed bar code module LPM and a card punch CPE.

50 The operation of the equipment will be described with reference to Fig. 2 and Fig. 3. Fig. 3 shows a flow diagram of the sequence

of operations performed under the control of the sequence logic VSI. Typically this sequence control logic may be implemented using a suitably programmed micro-processor.

70 The following description will be sectionalised in accordance with the steps shown in Fig. 3.

As mentioned previously in the free state the READY illumination is lit and this is indicated at step S0 in Fig. 3.

75

STEP S1 Is card in card reader?

The vote registration sequence is started by inserting a bar coded card EC into the card reader CR. The presence of the card is detected by the detector D and the sequence logic exits from Step 1 on the y path to Step S2 causing the READY lamp to be extinguished. In the absence of a card EC the sequence control logic loops around steps S0.

85 and S1 waiting for the entry of a card.

STEP S2 VOTER BUSY

In this step the sequence logic causes the BUSY indicator VBI to be switched on and 90 latched before performing step S3.

STEP S3 BAR CODE OK?

In this step the bar code is read from the card EC by the bar code reader BCR and the 95 result is compared with that stored in the local programmed bar code module LPM and communicated to the sequence control logic VSL. The local programmed bar code module LPM is manufactured as a plug-in device allowing 100 each machine to be uniquely encoded. If the code on the inserted card EC does not compare with that in LPM the bar code assessment logic BCAL will produce the card reject signal CRR causing steps S4 and S5 to be 105 performed. Alternatively, if the bar code read corresponds with the code in LPM, signal CROK is produced and step S6 is performed.

STEP S4 LIGHT VOTE REJECTED

110 In this step the VOTE REJECTED lamp VRI is lit and then step S5 is performed.

STEP S5 IS EDR KEY RESET?

The sequence control logic loops around 115 steps S4 and S5 keeping the VOTE REJECTED lamp lit until the key operated reset button is activated to reset the machine after a rejected vote.

120 STEP S6 OPERATE PS

This step is performed if the bar code equates to that in LPM in step S3. In this step the power switch PS is activated by the sequence control logic VSL to switch on the 125 power to the vote selection switching devices. The voter sequence control logic VSL now enters step S7.

STEP S7 VOTE CAST?

130 The sequence control logic will test the

output of the vote detector VD to see if one of the vote selection pads has been pressed. The sequence control logic performs a loop involving steps S7 and S8 looking for the operation of a vote selection pad or the maturing of a predetermined time-out period. If the time-out period matures step S4 is entered and the vote rejected.

When a vote selection pad is pressed the ganged pair of electrical switches are closed and one switch of the pair activates the vote cast signal VC from the vote detector VD which causes step S8 to be performed. At the same time as the vote detector VD detects the activation of one of the switches VBA, VBB or VBC the corresponding voting latch circuit VLA, VLB and VLC will be operated by the other switch of the ganged pair to inject one pulse, and one pulse only, into the corresponding counter CA, CB or CC. Typically the voting latch circuit VLA, VLB and VLC are arranged to latch to the first switching of the vote switching devices so that multiple operation of the same vote pad results in the recording of one vote only. The vote counters are binary counters and to provide security against failures may consist of a triplicated array of such counters for each vote selection.

30 STEP S9 LOCKOUT VOTING LATCHES

In this step the voting latch circuits VLA, VLB and VLC are locked-out so that pressing of their corresponding voting pads will not be effective. This arrangement ensures that only one vote is registered for each operation of the machine. Step S10 is now performed by the sequence control logic VSL.

STEP S10 DRIVE CARD PUNCH

40 In this step the vote detector VD is activated by signal VR to cause the vote selection to be registered on the card EC by activating the card punch equipment CPE. The card punch equipment CPE consists of an electromagnetic hole puncher for each vote selection and the vote detector selects which puncher is activated as required.

STEP S11 DISPLAY VOTE ACCEPTED

50 In this step the sequence control logic VSL illuminates the VOTE ACCEPTED lamp VAI and then performs step S12.

STEP S12 RELEASE CARD

55 In this step the sequence control logic operates the flap control electro-magnetic CFL to allow the card to fall into the card box CSB.

STEP S13 RESET BUSY LAMP

60 In this step the BUSY lamp VBI is turned off to indicate that the voting process is completed.

STEP S14 RESET VOTE LATCHES

65 In this step the "lockout" on the voting

latch circuits VLA, VLB and VLC applied in step S9 is removed in preparation for the next use of the machine.

The machine now returns to step S0 to

70 light the READY LAMP.

From the above it can be seen that successive vote selections signalled by the pressing of the vote selection pads are recorded in the corresponding binary counters CA, CB, CC as

75 appropriate and also recorded in the appropriate point on the card EC by a punched hole. Ultimately the voting machine will be taken for read-out and the read-out logic R-OL, conditioned by the read-out sequence signal

80 ROSS, will cause the contents of the counters

to be presented in parallel form in a predetermined sequence to the read-out leads RO1-X.

The above description has been of one

85 illustrative embodiment only and the scope of the invention is not intended to be limited by it. Alternative arrangements will readily be seen by those skilled in the art for example the method of recording a vote on the coded card is described as a punched hole arrange-

90 ment however alternative arrangements such as ink jet markers of the like could be used. Also the card is described as bar coded but any suitable type of encoding such as magnetic stripe could be used. Finally the machine

95 has been described as being interrogated after transportation to a central read-out office, however with the use of telephone lines and encoded modem equipment, the voting machines could be remotely read-out if required.

100

CLAIMS

1. A voting machine having a vote selection presentation area including a plurality of manually operable switching devices, one for

105 each vote selection and adapted to register the operation of the corresponding switching device and a vote selection mechanism locking arrangement adapted to be unlocked by a suitably coded card, the machine being ar-

110 ranged such that the reception of the suitably coded card frees the vote selection mechanism to allow a vote selection to be recorded in the appropriate counter and the coded card is retained in the voting machine.

115 2. A voting machine as claimed in claim 1 in which the coded card carries a bar-code and the machine includes a bar code reader.

3. A voting machine as claimed in claim 1 or 2 in which the machine includes means for

120 recording the recorded vote selection on the coded card.

4. A vote machine as claimed in claim 3 in which the machine includes a hole punch arrangement adapted to punch a hole in the

125 coded card to record a vote selection.

5. A voting machine as claimed in claim 1, 2, 3 or 4 in which the counters are binary counters.

6. A voting machine as claimed in any

130 preceding claim in which a counter read-out

arrangement is provided to allow the contents of the counters to be read-out from the machine.

7. A voting machine as claimed in claim 5 1, 2, 3, 4, 5 or 6 in which electronic arrangements are provided to ensure that only one selection is registered for each operation of the machine.
8. A voting machine as claimed in any 10 preceding claim in which the code carried by a coded card is compared with an internally stored code which is particular to the machine.
9. A voting machine as claimed in any 15 one of the preceding claims in which the operation sequence is controlled by a micro-processor.
10. A voting machine substantially as described in conjunction with the accompanying 20 drawings.

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